



RECEIVED
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TECHNOLOGY CENTER 2800

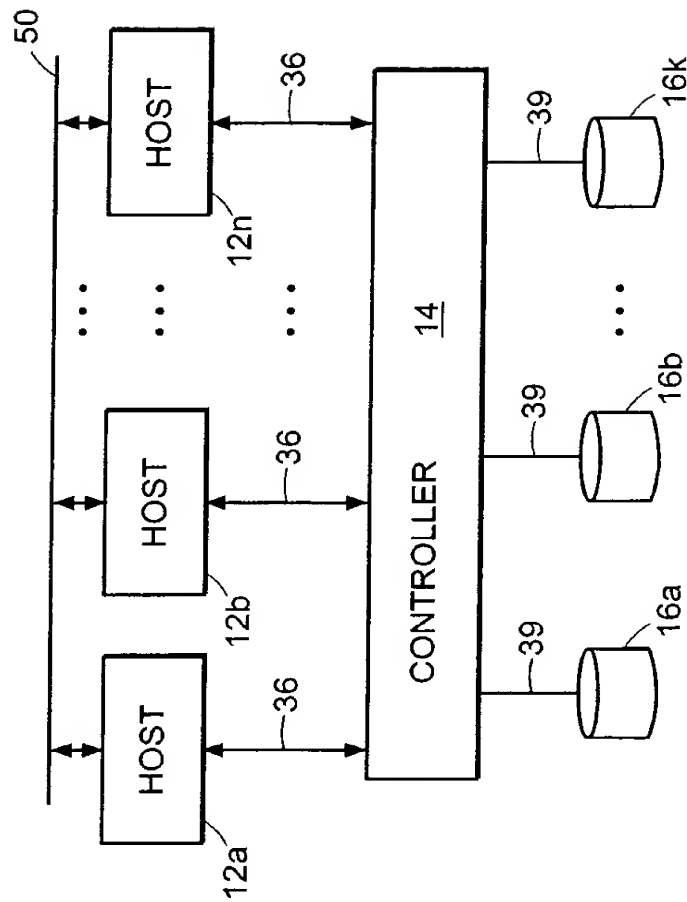


FIG. 1

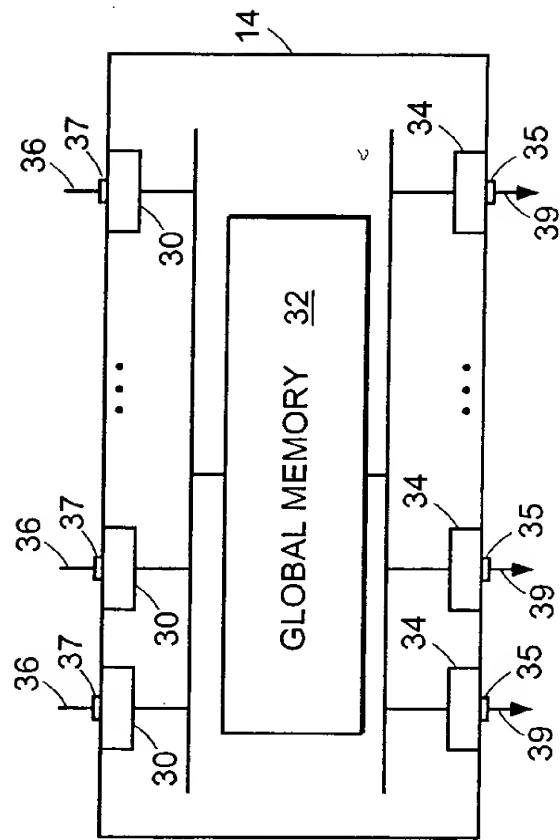


FIG. 2

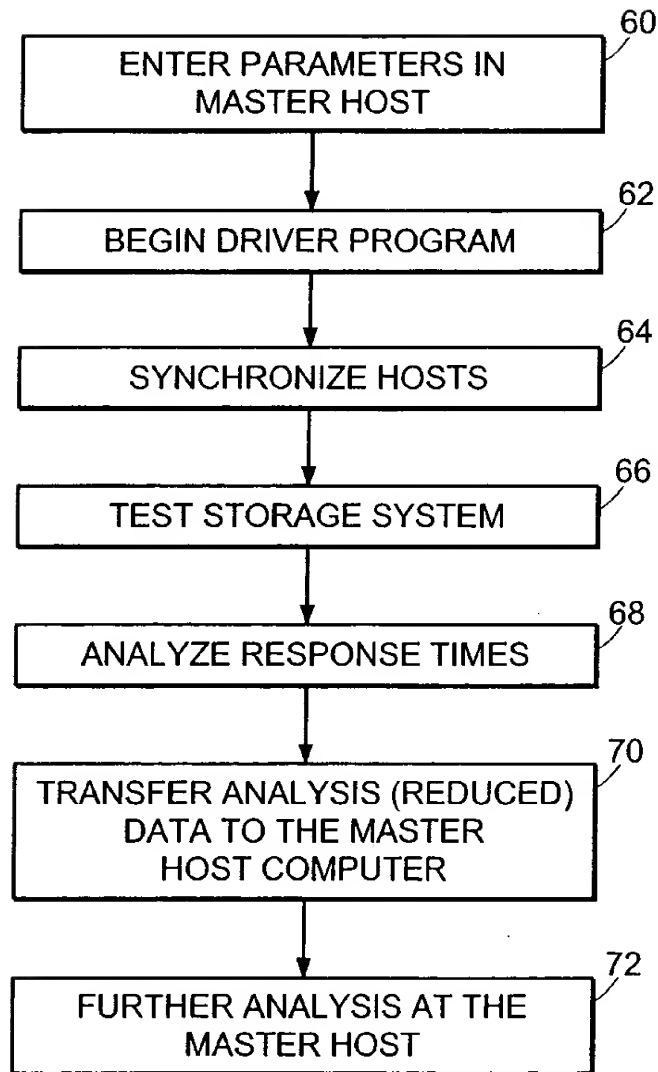


FIG. 3



FIG. 4A
FIG. 4B

FIG. 4

REQUIRED	NUMBER OF LOGICAL DISKS
	NUMBER OF "CHILD" PROCESSES TO START
	NUMBER OF CAPTURE RESPONSE TIMES
	NUMBER OF RESPONSE TIMES
	BUFFER SIZE
	OFFSET SIZE
	MAXIMUM RANGE
	TIME OF TEST
	READ/WRITE SIZE
	READ/WRITE MIX

FIG. 4A



OPTIONAL	ID OF DEVICES BEING TESTED
	ID OF MASTER & CLIENT HOSTS
	I/O TYPE (SEQUENTIAL OR RANDOM)
	NUMBER OF I/O OPERATIONS PERFORMED TO CORRECT OFFSET
	DISPLACEMENT FROM OFFSET
	DELAY BETWEEN COMMANDS
	INITIAL BYTE OFFSET
	NUMBER OF SEEKS FOR RANDOM I/O
	DATA REDUCTION METHOD
	ICDA PERCENT HIT RATE

FIG. 4B

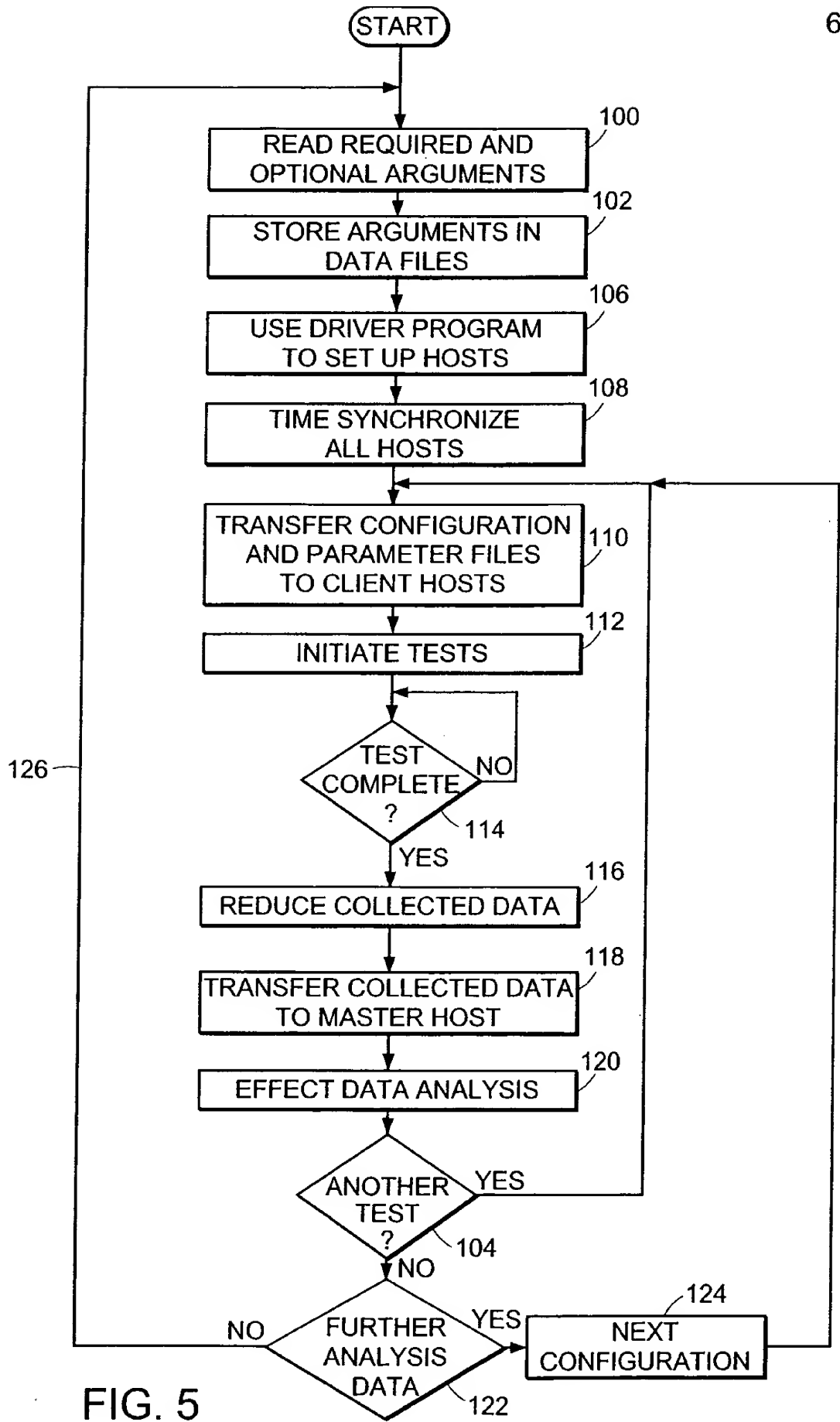


FIG. 5

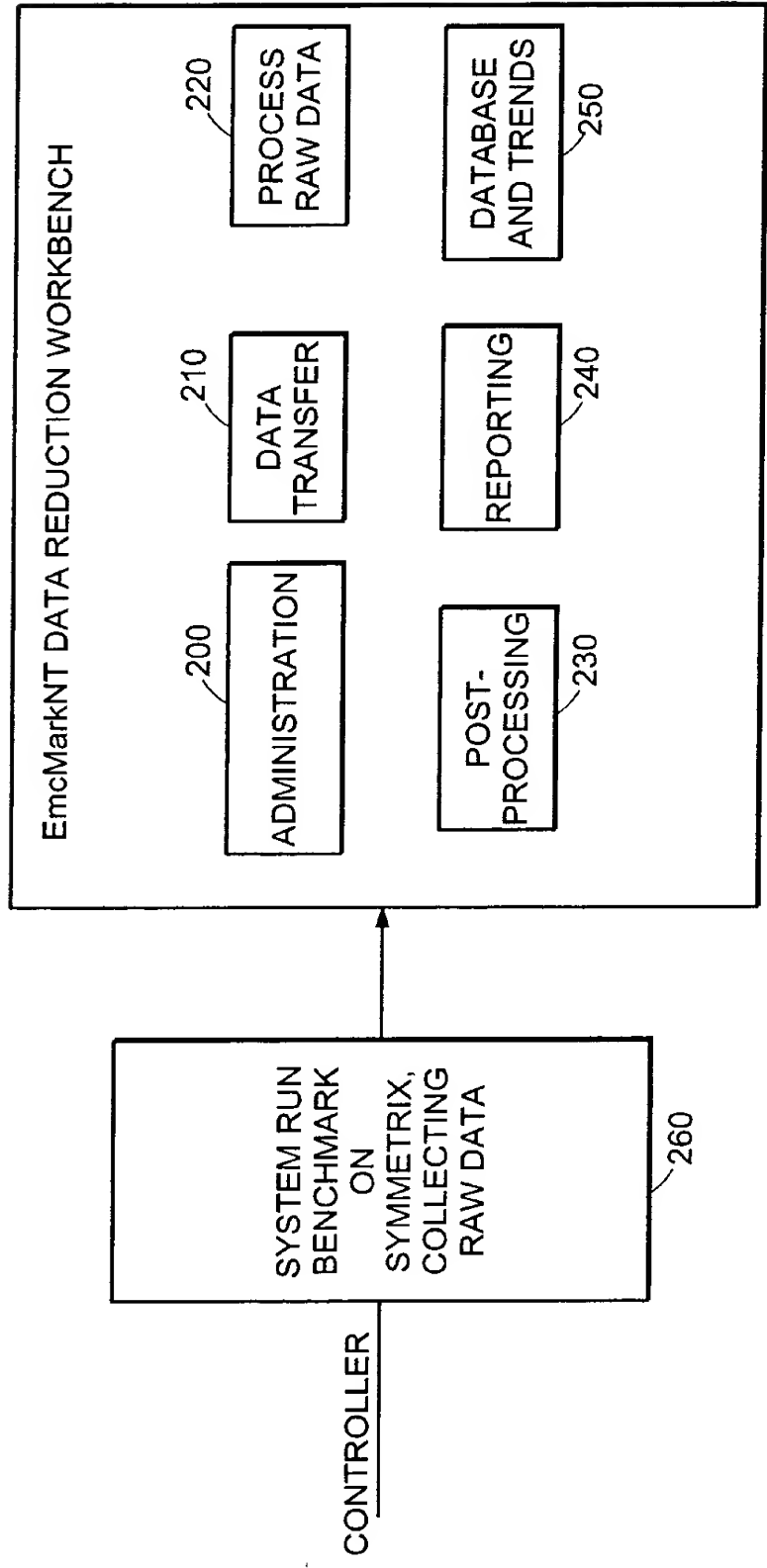


FIG. 6

EmcMarkNT DATA REDUCTION WORKBENCH FLOW

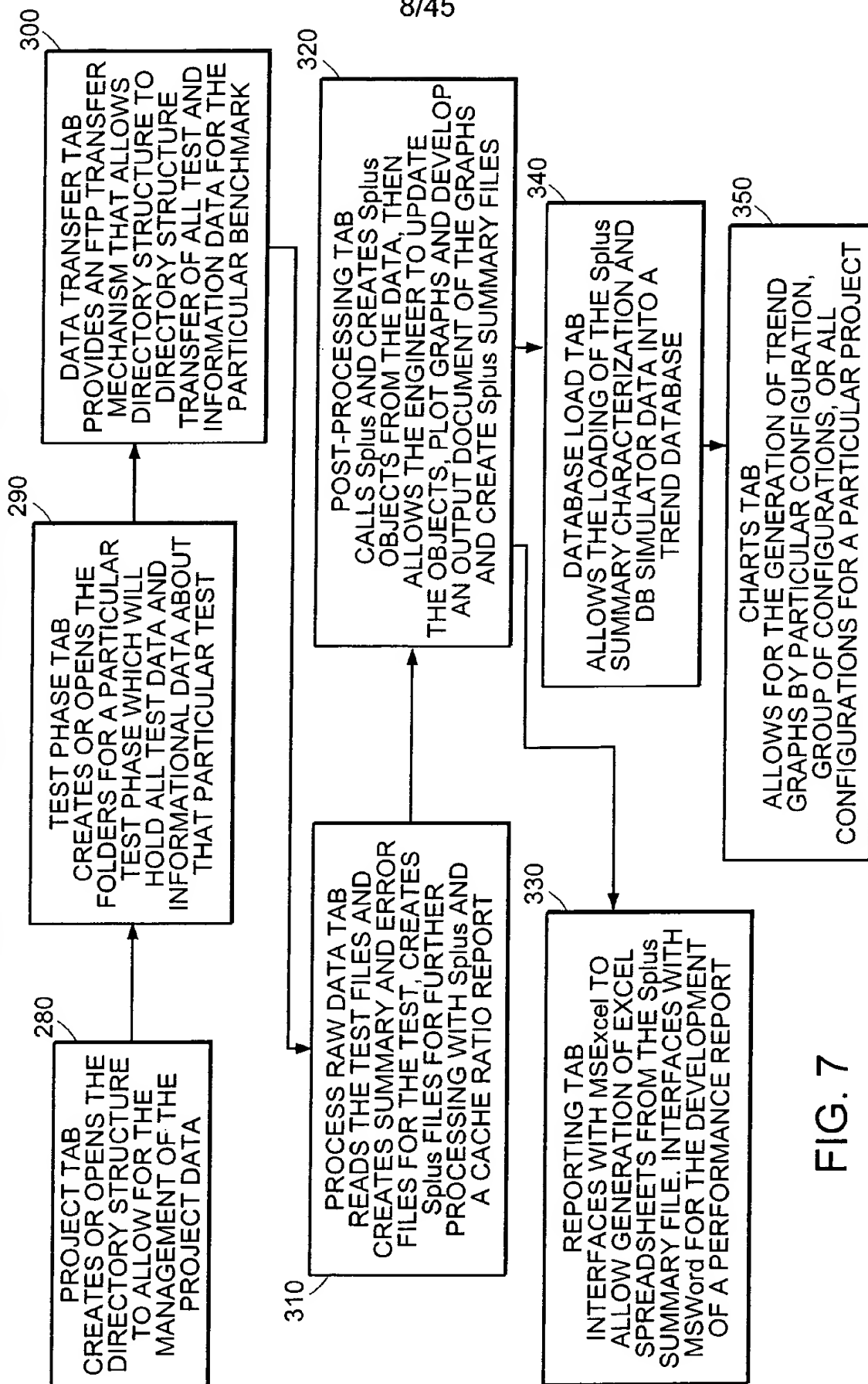
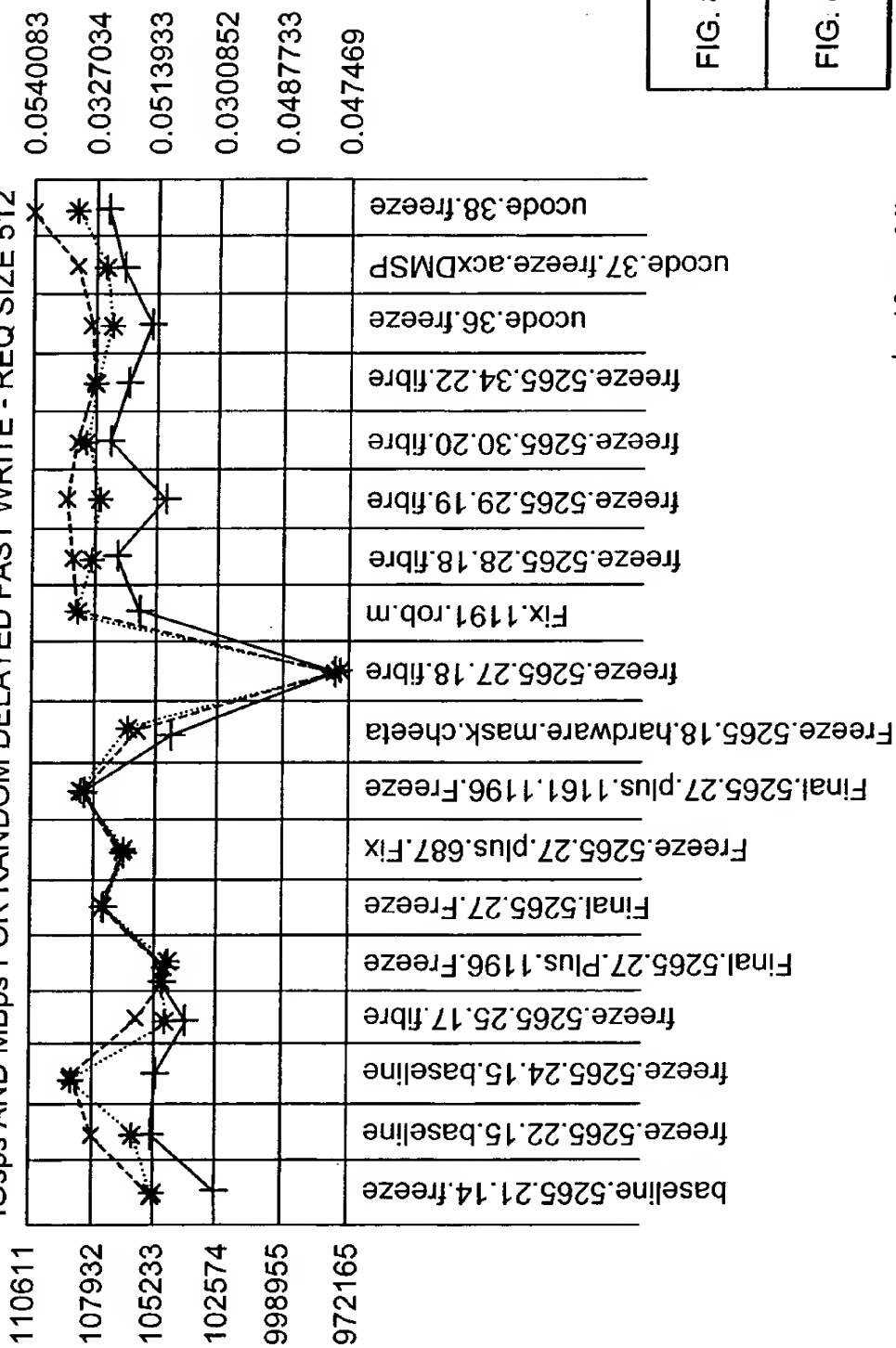


FIG. 7



IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512



1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

+ 10sps Min
- * - 10sps Max
* MBps Median

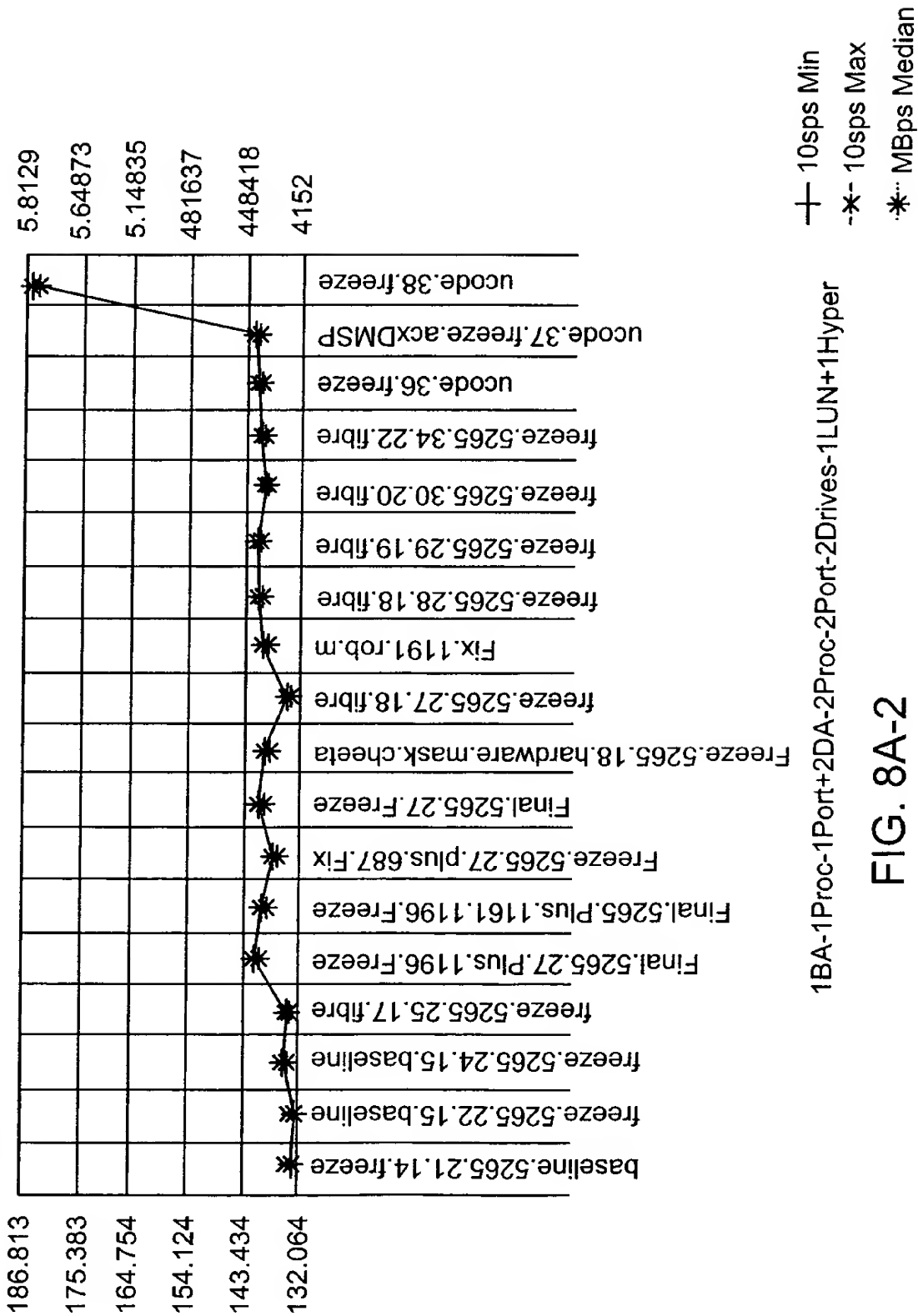
FIG. 8A-1

FIG. 8A-1	FIG. 8A-2
FIG. 8A-3	FIG. 8A-4

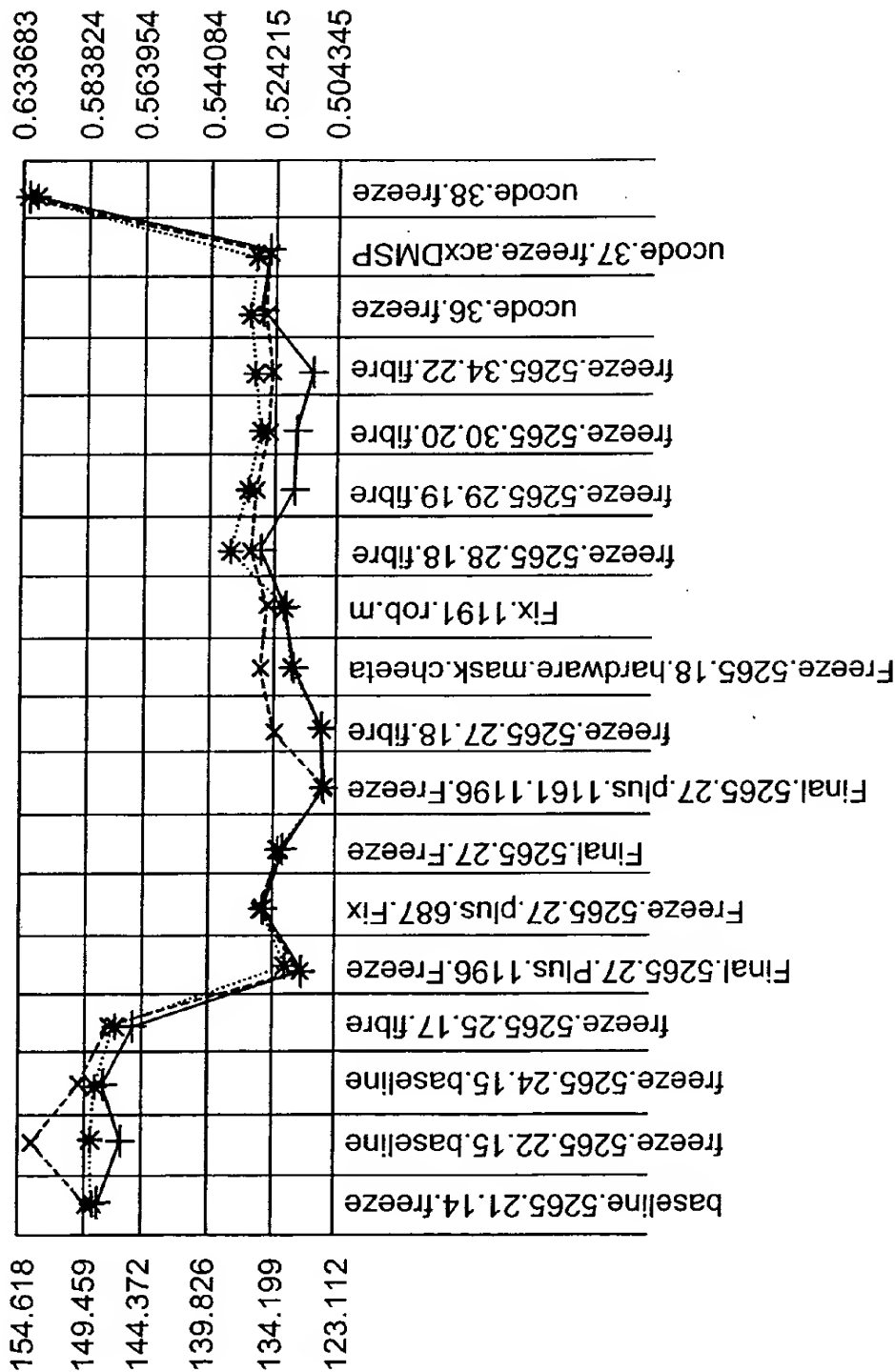
FIG. 8A



IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 32768



IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4896



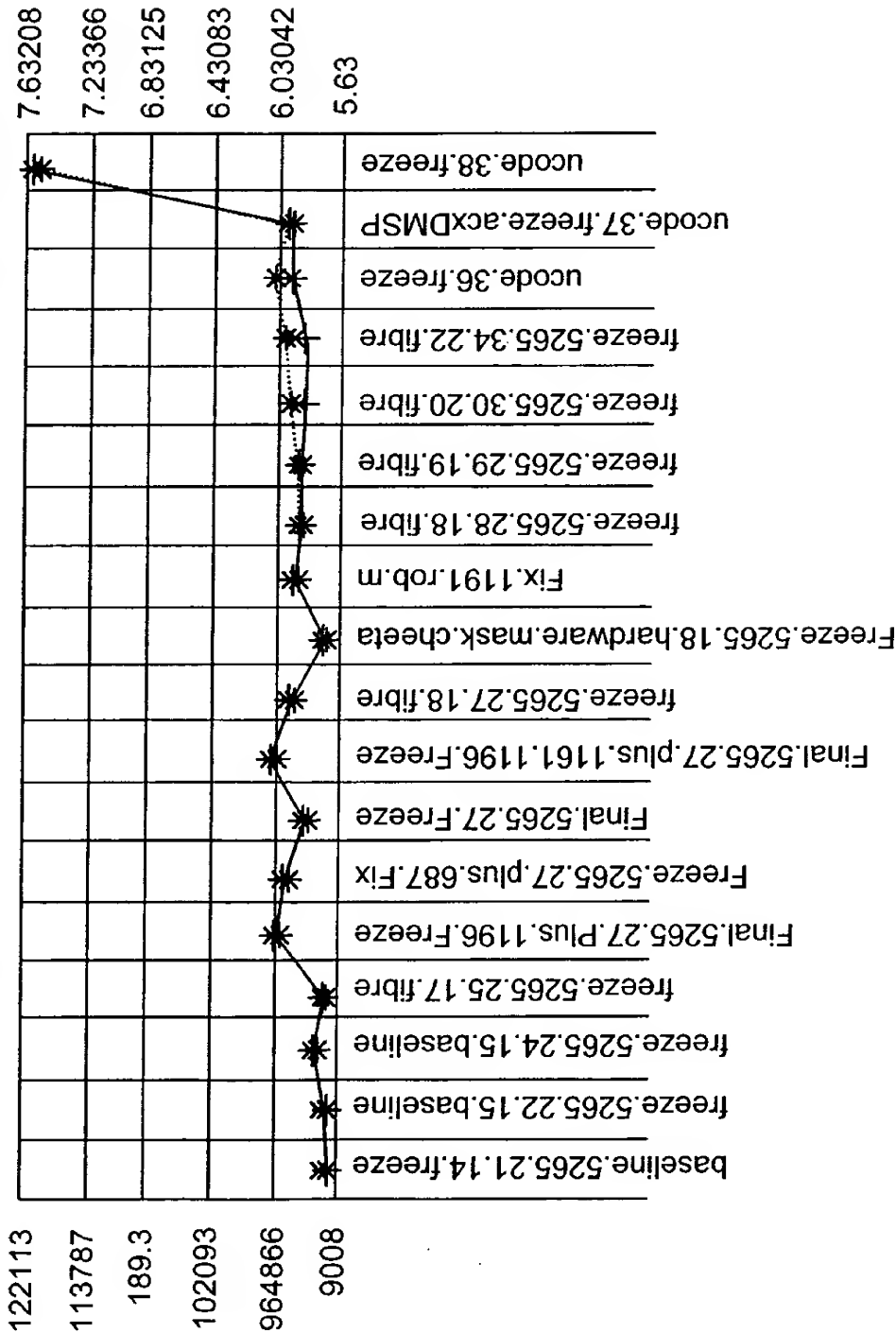
1BA=1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

FIG. 8A-3

+ 10sps Min
- * - 10sps Max
* MBps Median



IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536



1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

FIG. 8A-4

+ 10sps Min
- * 10sps Max
* MBps Median



IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512

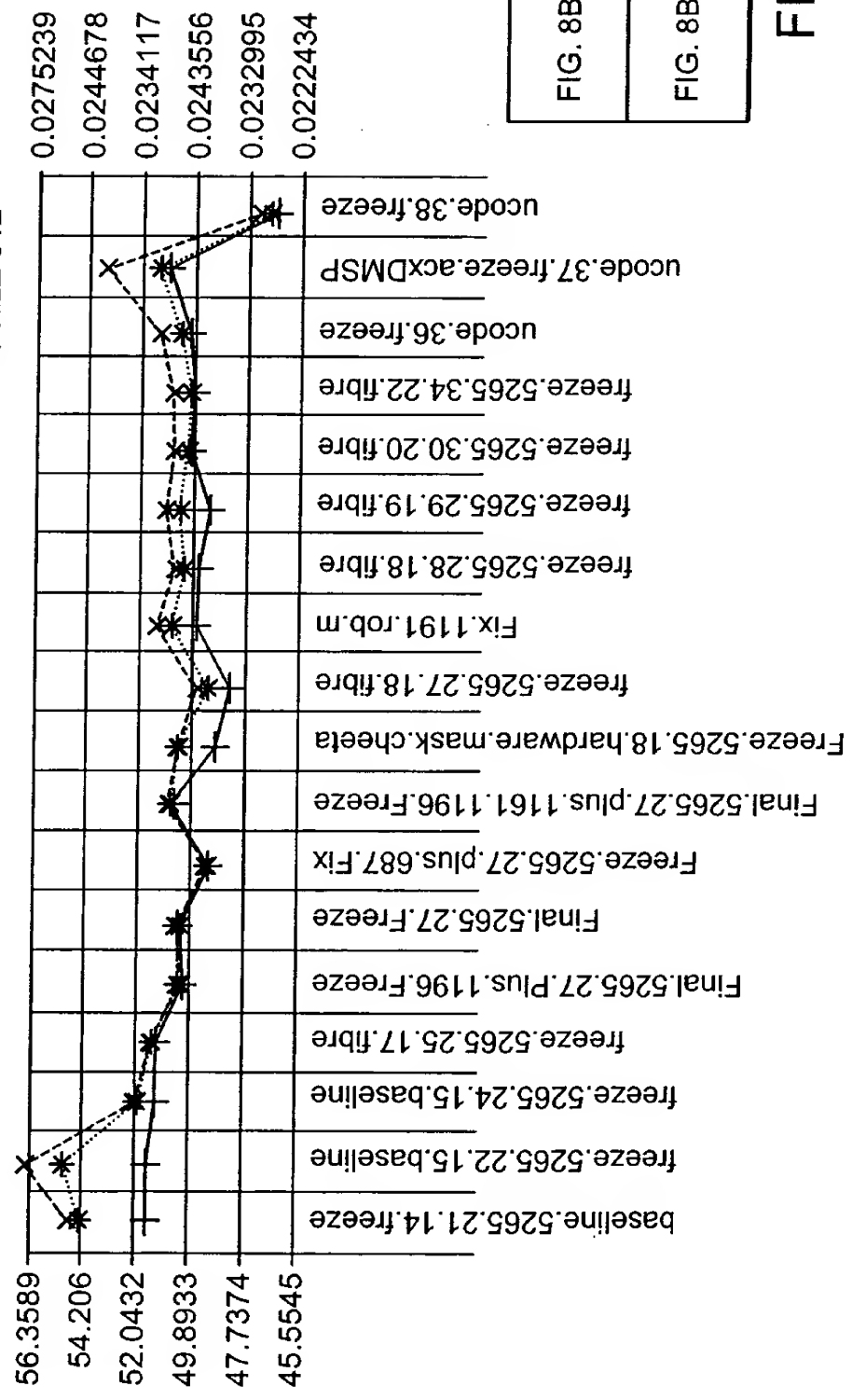


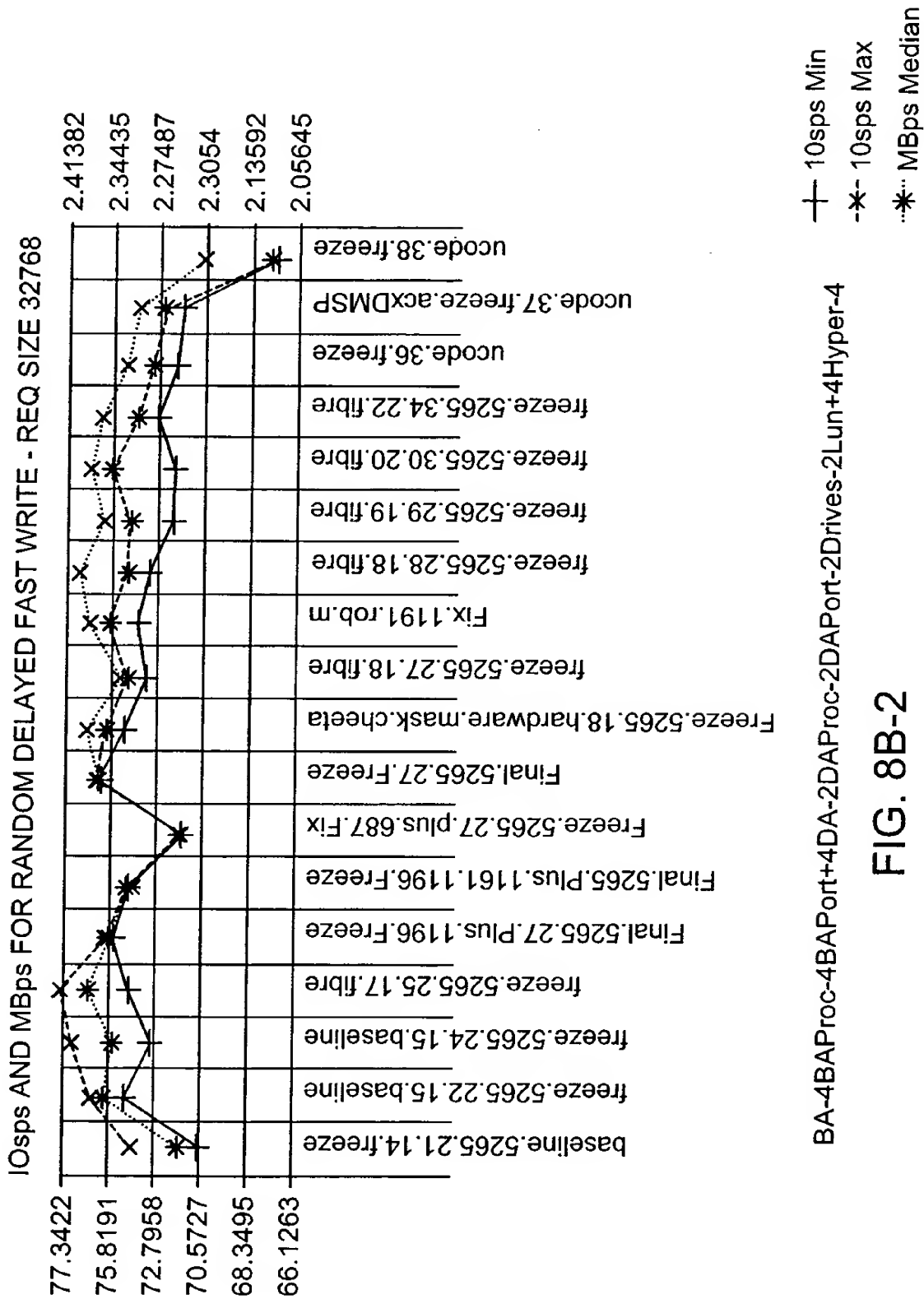
FIG. 8B-1	FIG. 8B-2
FIG. 8B-3	FIG. 8B-4

FIG. 8B

- + 10sps Min
- * 10sps Max
- * MBps Median

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

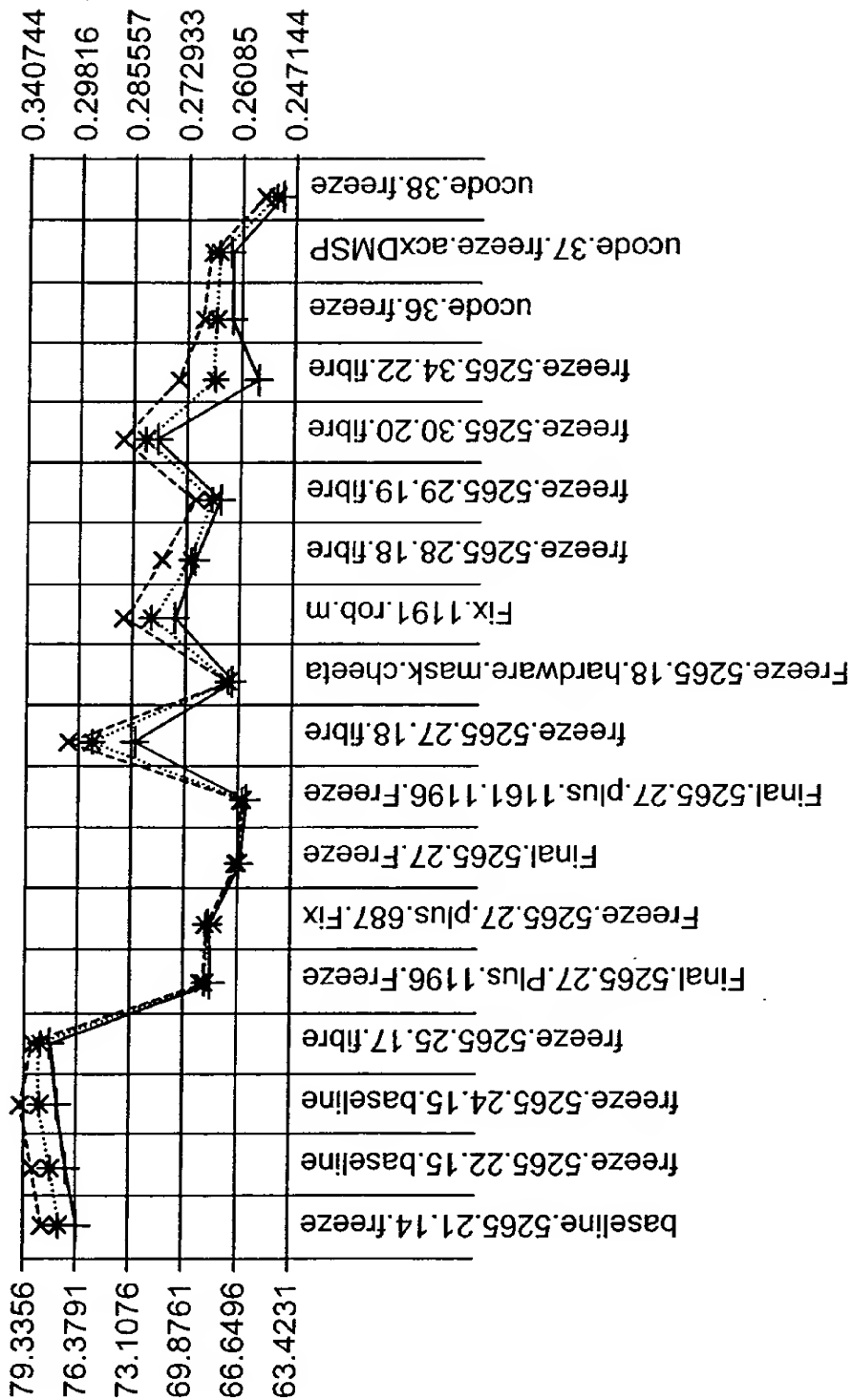
FIG. 8B-1



BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

FIG. 8B-2

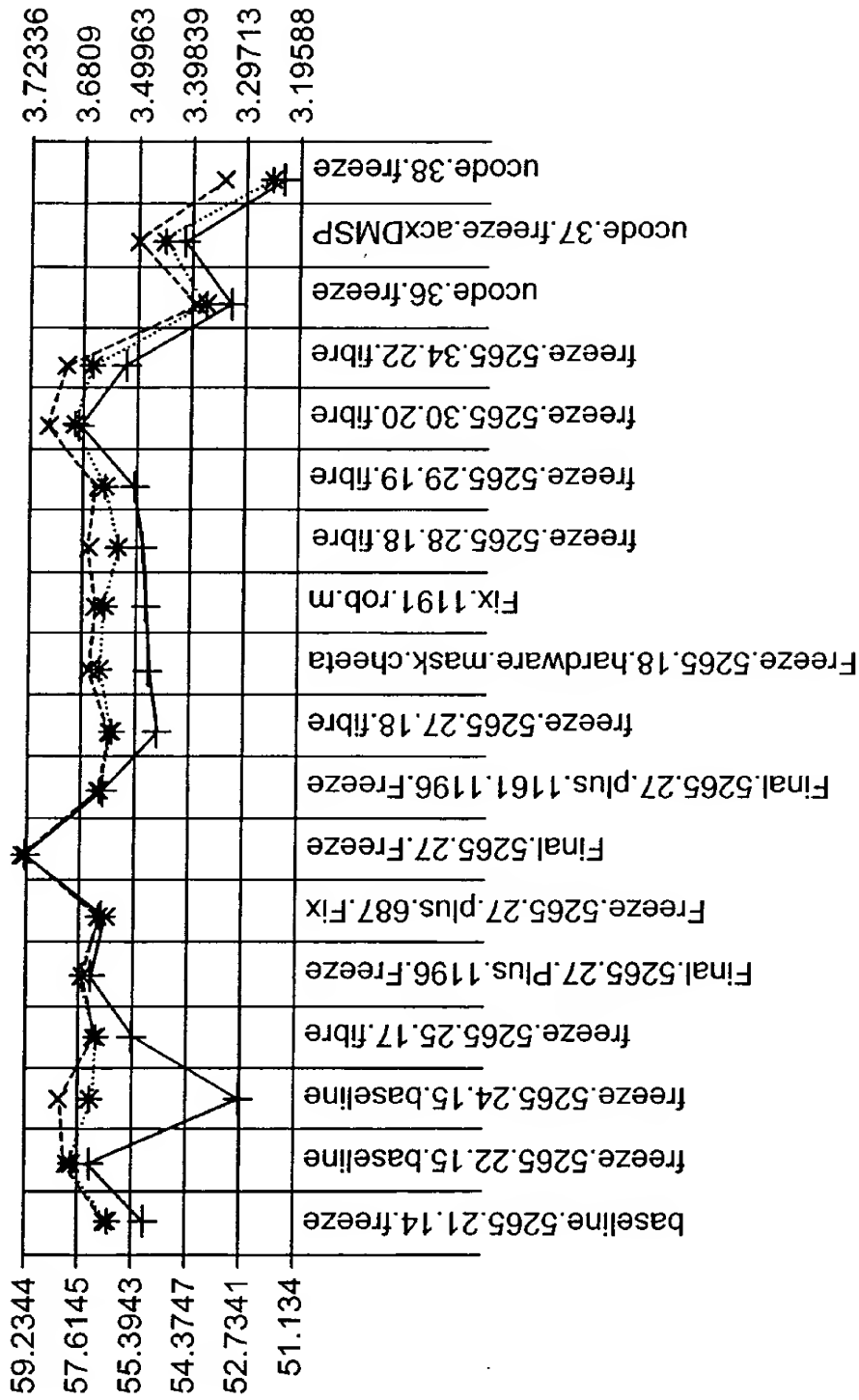
IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4096



BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4
 FIG. 8B-3
 + 10sps Min
 * 10sps Max
 * MBps Median



IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536



+ 10sps Min
-x- 10sps Max
* MBps Median

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

FIG. 8B-4

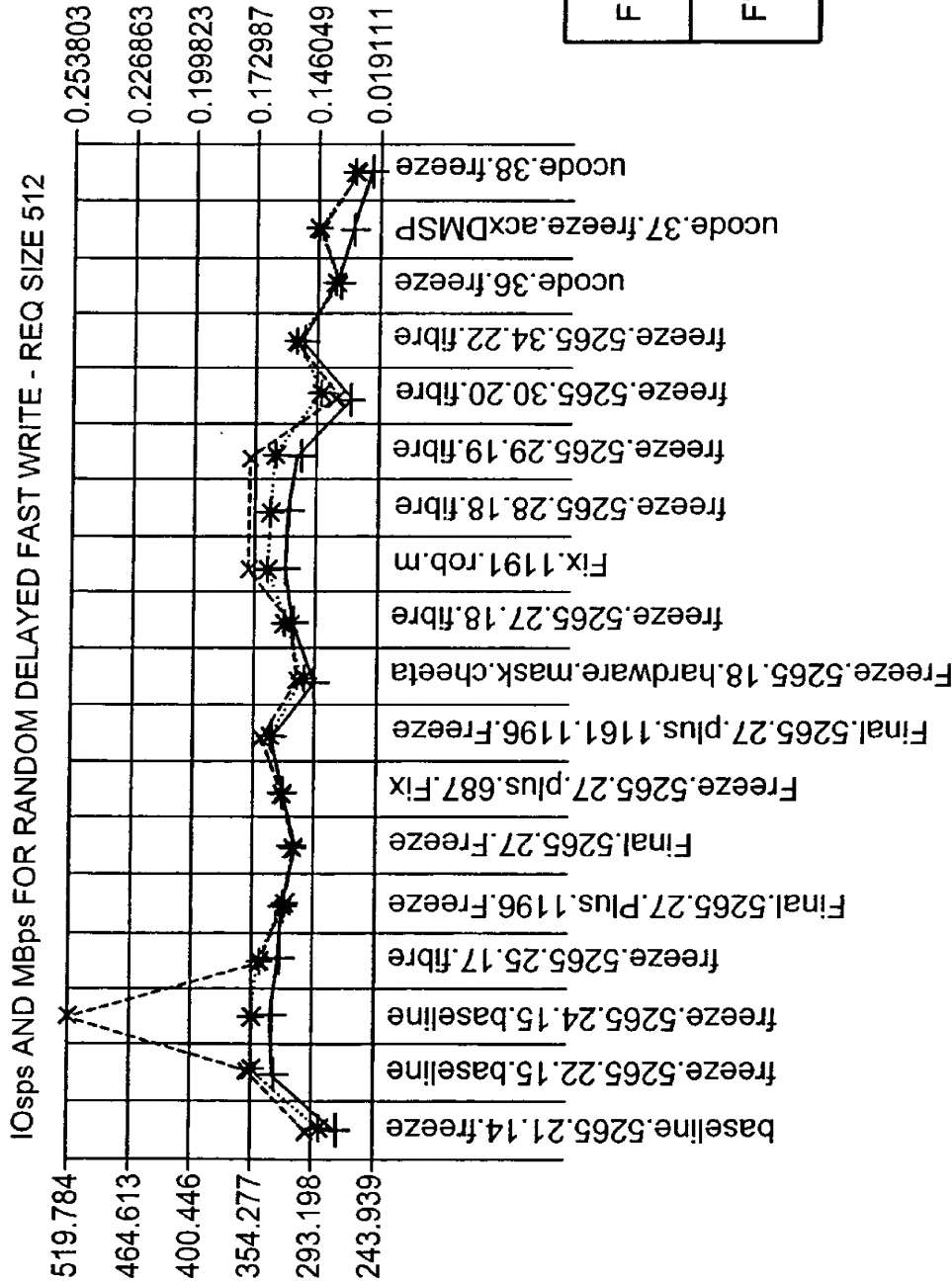


FIG. 8C-1	FIG. 8C-2
FIG. 8C-3	FIG. 8C-4

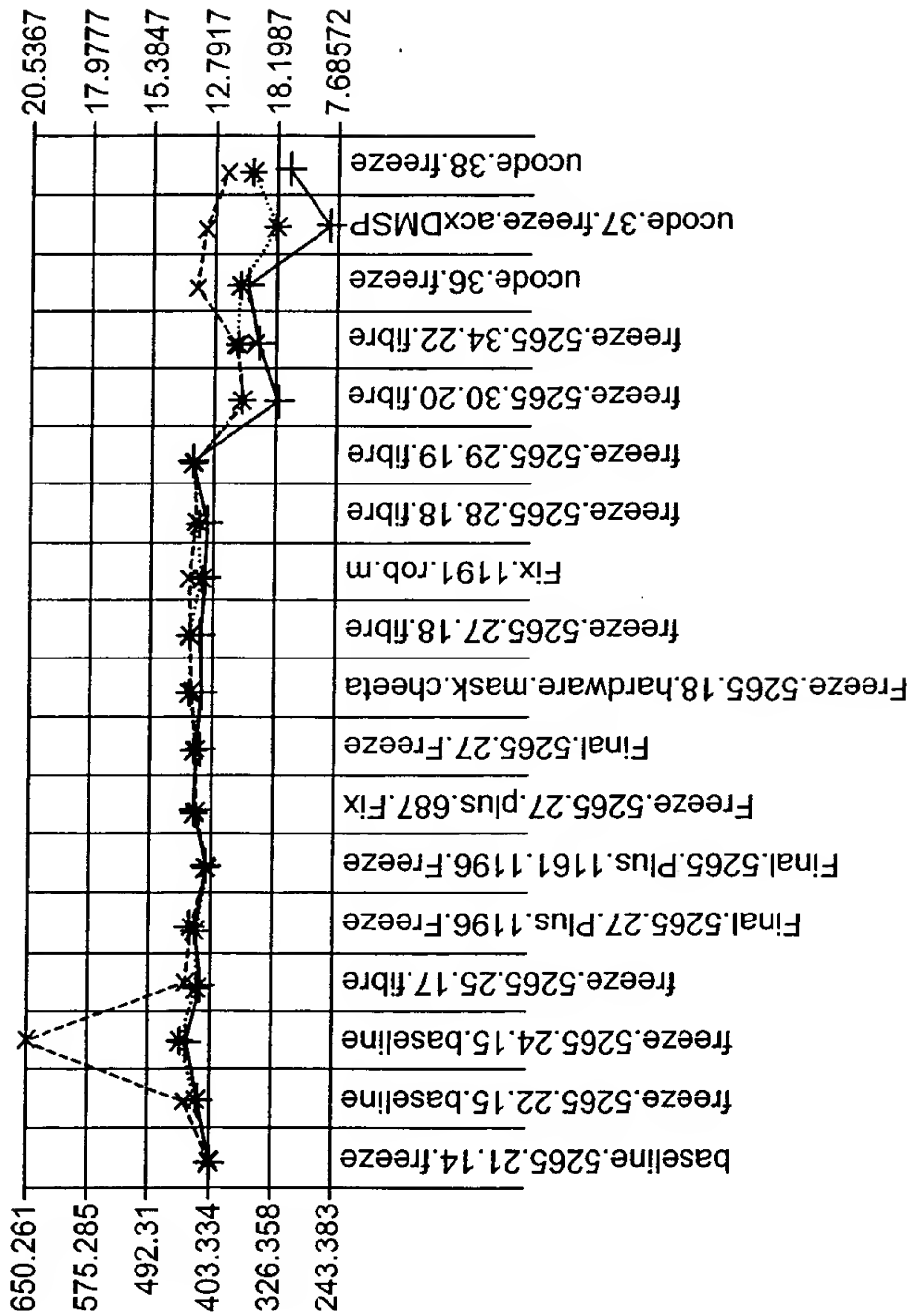
FIG. 8C

+ 10sps Min
- 10sps Max
* MBps Median

BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

FIG. 8C-1

IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 32768



+ 10sps Min
 -x- 10sps Max
 ...* MBps Median

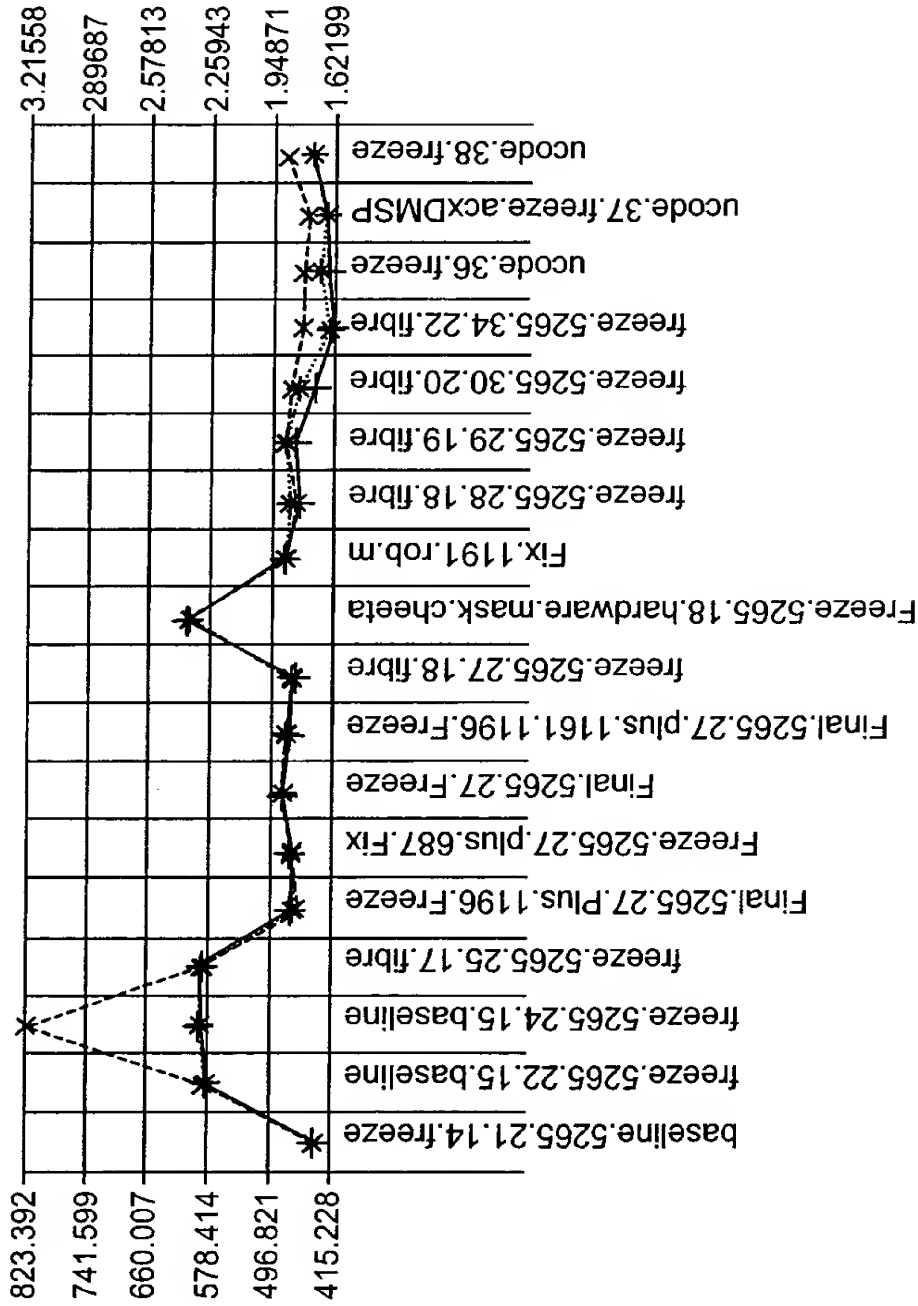
BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

FIG. 8C-2





IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4896



+ 10sps Min
x 10sps Max
* MBps Median

BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

FIG. 8C-3



IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536

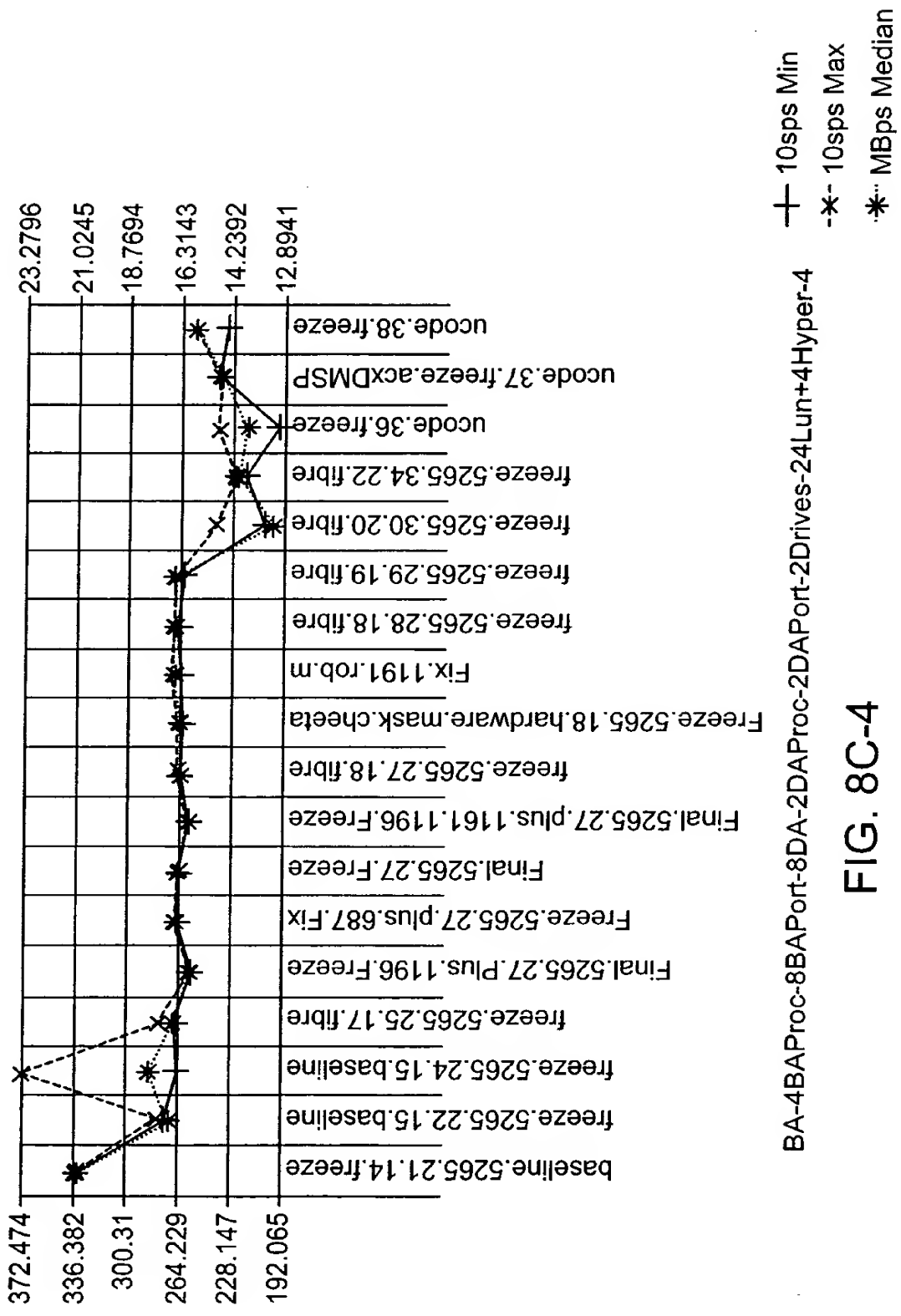
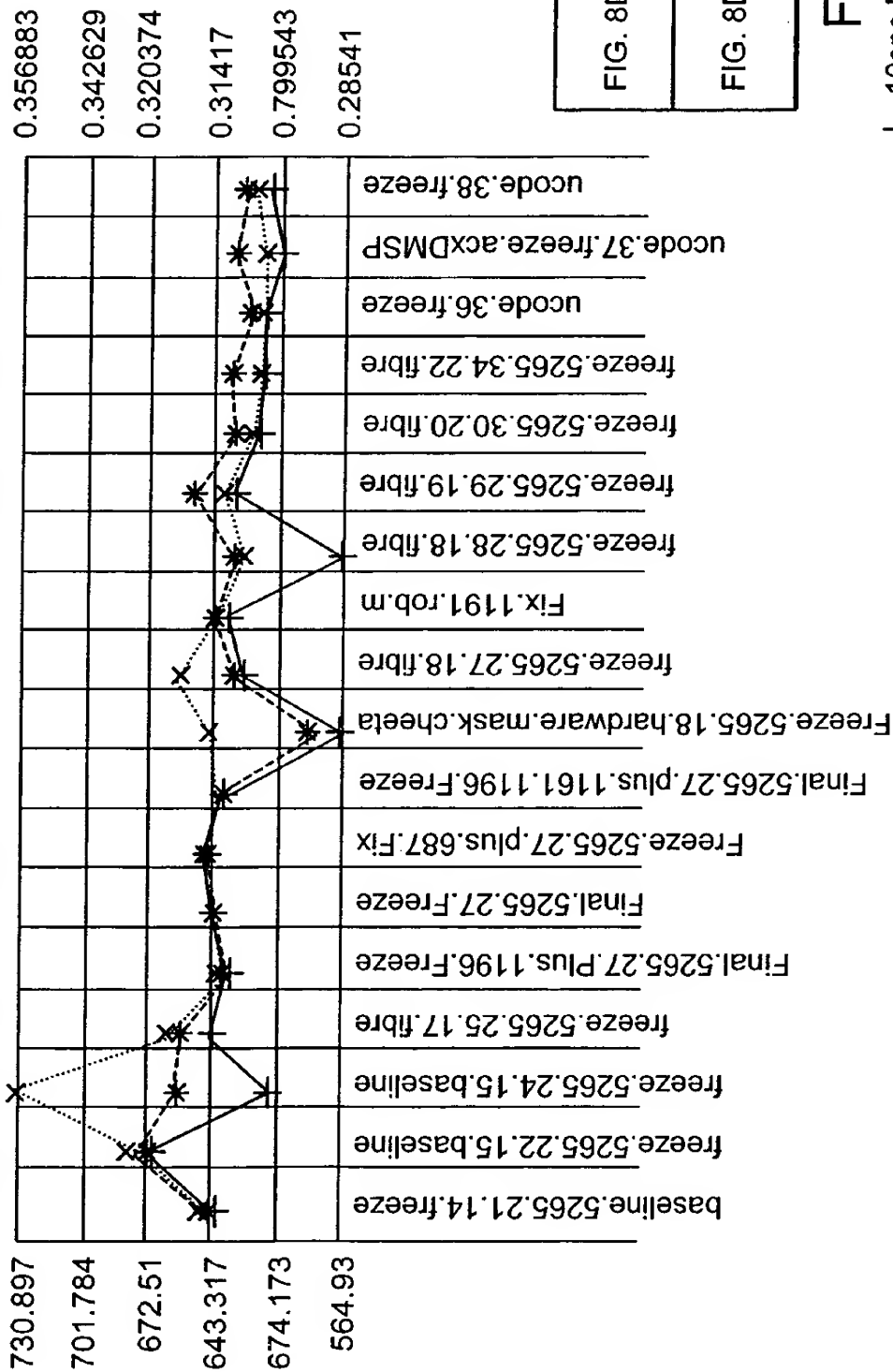


FIG. 8C-4

BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4



IOsps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512



BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

FIG. 8D-1

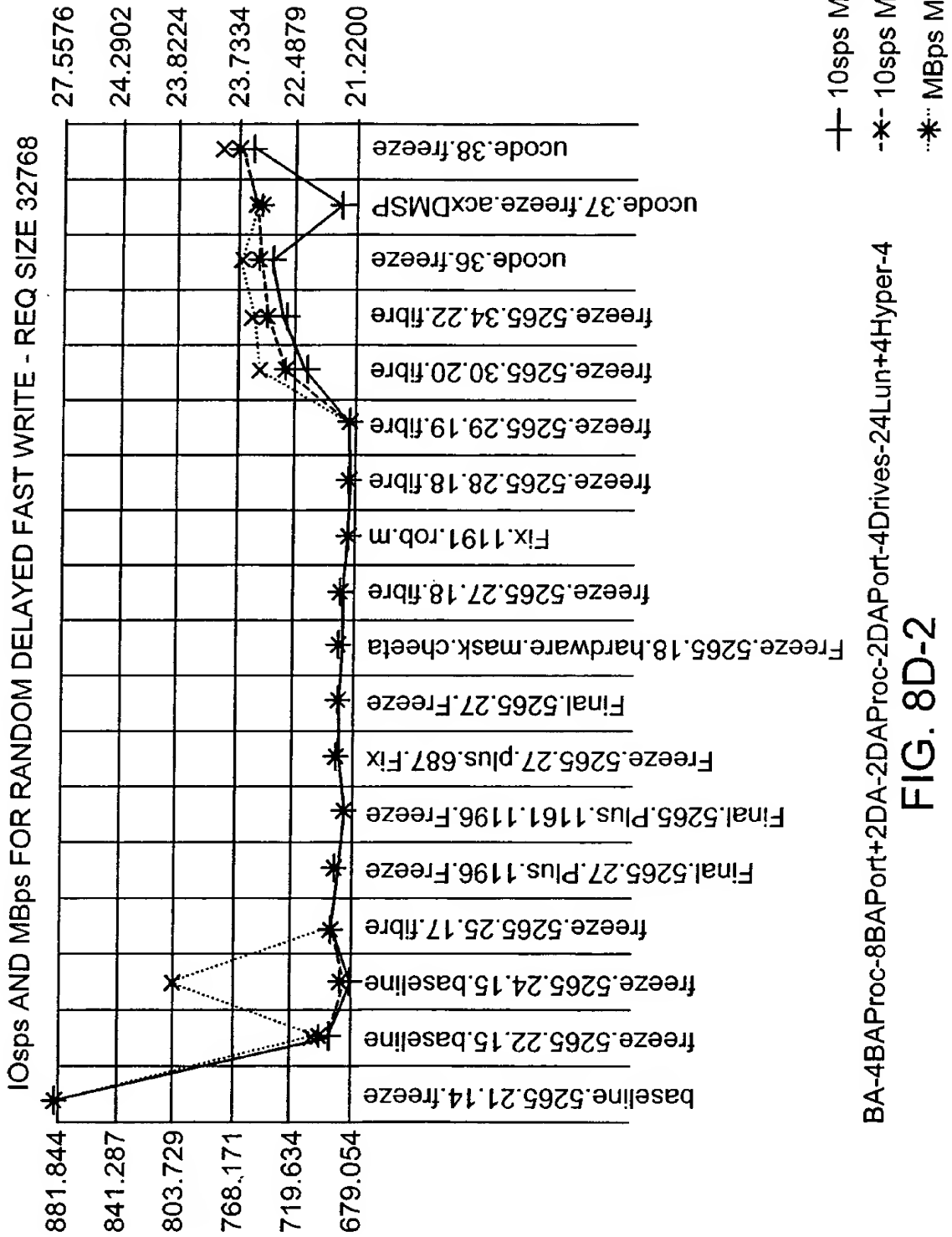
FIG. 8D

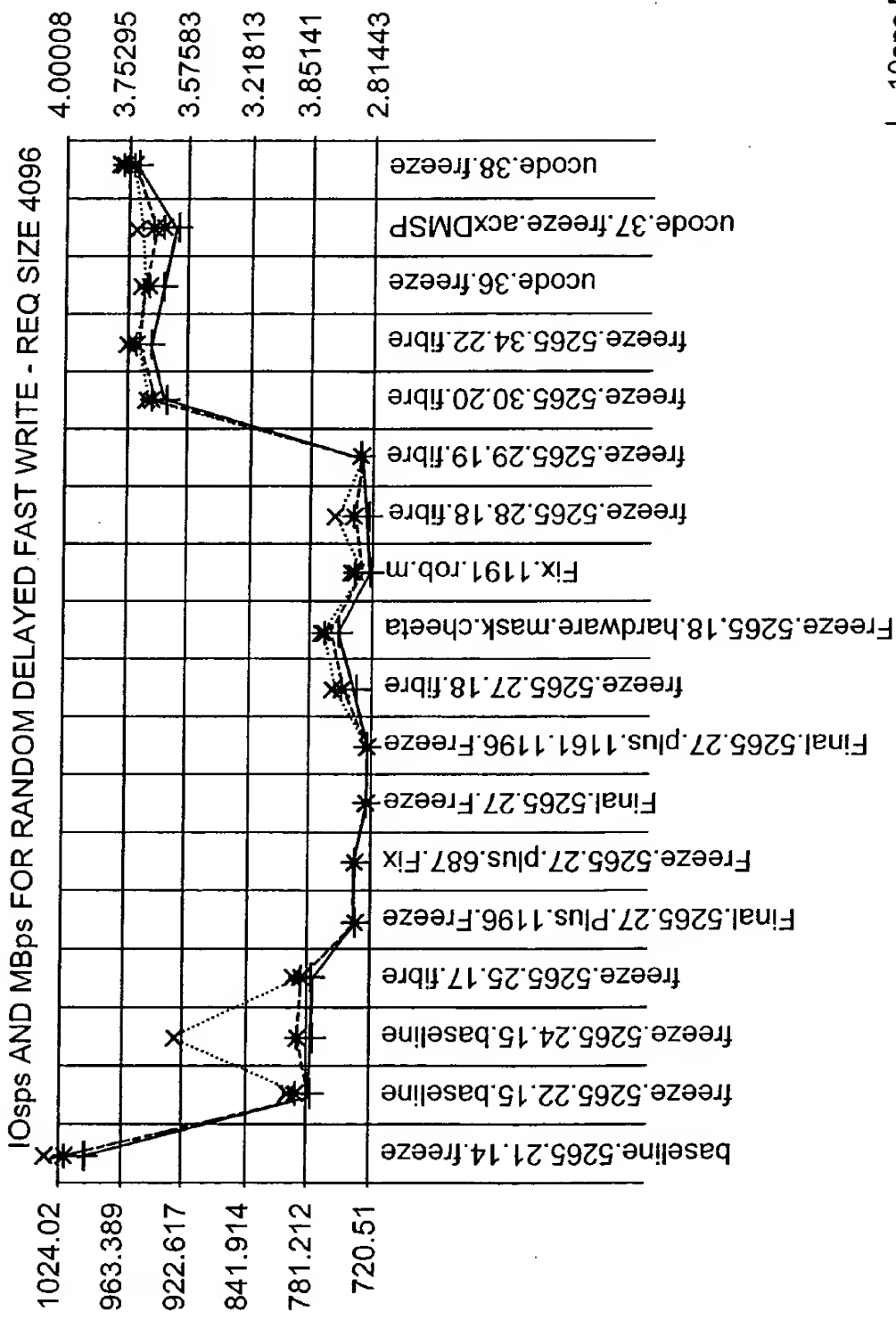
- + 10sps Min
- x- 10sps Max
- * MBps Median

FIG. 8D-1	FIG. 8D-2
FIG. 8D-3	FIG. 8D-4



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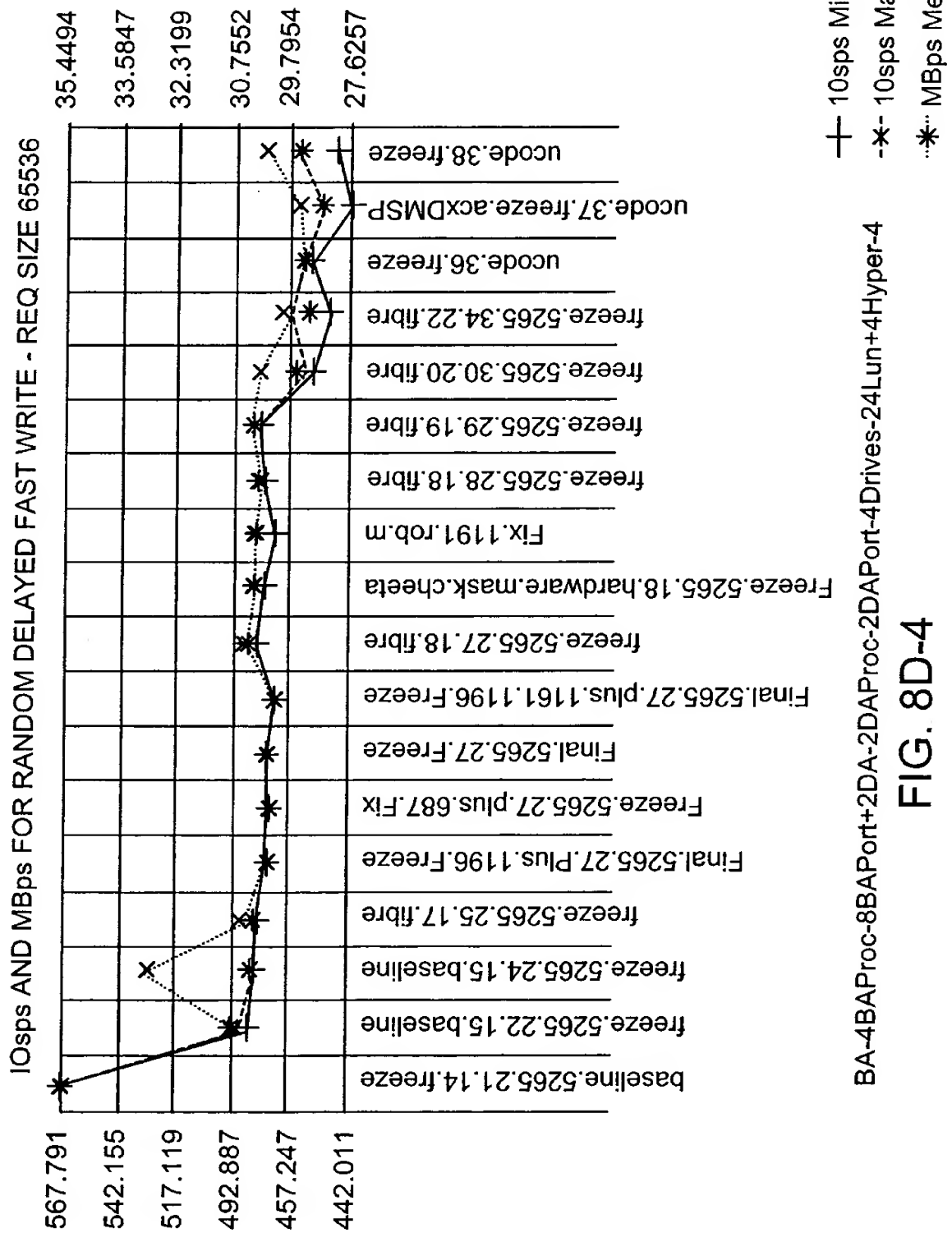




+ 10sps Min
* 10sps Max
* MBps Median

BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

FIG. 8D-3



BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

FIG. 8D-4



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POST PROCESSING TAB
THE POST PROCESSING TAB CREATES OBJECTS, PLOT GRAPHS AND GENERATES SUMMARY
FILES USING THE Splus DATA ANALYSIS SOFTWARE.

Emc MarkNT

File Edit Project Log View Help

Project

Test Phase

Data Transfers

Process Raw Data

Post-Processing

Reporting

Database Lead

Characterization

Create Object

Update Object

Plot Graphs

View Graphs

Generate Summary

View Summary

Database Simulator

Create Object

Plot Graphs

View Graphs

Generate Summary

View Summary

Splus

Start SPlus

Close SPlus

View Style

☐ 2 Graphs/Page

☐ 8 Graphs/Page

☒ 12 Graphs/Page

☐ 15 Graphs/Page

MetaNT\Fibre.EmulexA

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11:36 AM

FIG. 9



SYMMETRIX CONFIGURATION VIEW

Emc MarkNT Performance Characterization W

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

CPQ01

000183500055

CPQ02

000183500055

Hostname

CPQ01

Add

Remove

Refresh

Emc MarkNT Performance Characterization W

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

CPQ02

000183500055

FA-1A

DA-2A

DA-3A

FA-5A

FA-12A

DA-14A

DA-15A

SA-16A

FA-1B

DA-2B

DA-3B

FA-5B

FA-12B

Hostname

CPQ01

Add

Remove

Refresh

Emc MarkNT Performance Characterization W

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

DA-2B

DA-3B

FA-5B

FA-12B

DA-14B

DA-15B

SA-16B

IPHYSCALDR

IPHYSCALDR

IPHYSCALDR

IPHYSCALDR

IPHYSCALDR

IPHYSCALDR

Hostname

CPQ01

Add

Remove

Refresh

FIG. 9A



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DEVICE DETAIL

Device Details

Symmetrix

Vendor Id:
EMC

Product Id:
SYMMETRIX

Symmetrix Id:
000183500055

Director:
SA-16B

Port Number:
1

TID:
0

LUN:
0

Hyper Count:
2

Device Detail

Symmetrix Device:
000

Physical Device:
\\.\PHYSICALDRIVE0

Logical Device:

Serial Number:
55000321

Device Status:
Ready

Block Size:
512

Capacity:
7741440

Cylinders:
8064

Emulation:
FBA

Mirror Policy:
two-way mirror

Flags

☐ CKD

☒ META Head

☐ SSOC

☐ VCM

☐ Mixed

☐ PowerPath Parent

☐ PowerPath Child

☐ PowerPath Sibling

☐ No channel

☐ RDF

☐ BCS

☐ BCV

☒ META

OK

FIG. 9B




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SYMMETRIX DETAILS

Symmetrix	
Director Details	
Director:	Num Ports:
Director Type:	Port 0 status:
Director Num:	Port 1 status:
Slot Num:	Port 2 status:
SCIS Width:	Port 3 status:
FA-1A	1
Fibre Adapter	On
1	N/A
1	N/A
N/A	N/A
OK	

FIG. 9C


Emc MarkNT Performance Characterization Workbench


File
Actions
View
Help



Symmetrix Configuration

☒ Physical Device
☐ Symmetrix Device

cpq01



000183500055

Hostname

cpq01

Add

Remove

Refresh

Definition
Environment
Workload
Configuration
Benchmark
Results
Other

Definition

Project

Project Name: Bison.Roland
Test Phase: Full.Box.110199.Test
Test Description:

Storage Array

Storage Array: Symmetrix
Model: 3830
Serial #: 000183500055

Details

☒ Symmetrix 4.6

Code: 5265
Code Date: 06231999

Raid Type: Auto
Hyper Policy: Auto

Mirror Policy: Auto
Cache Size: 8GB

Physical Disks: 96
Disk Type: Auto

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FIG. 9D

ENVIRONMENT TAB

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

Physical Device

cpq01

..... 000183500055

Hostname

cpq01

Add

Remove

Refresh

Definition Environment Workload Configuration Benchmark Results

Environment

Master Host Directories

Tools Directory: /bench/EMCtools

Work Directory: /bench/work

Gateway:

Flags

DMSF

Auto

On

Off

Ignore

Flush Cache

IMPL Reset (\$FDCE)

Trace

Ignore

Stop

Clear

CKD

Defaults

Maximum Block Size

128

k

Block Sizes

512

1024

2048

4096

8192

16384

<1

FIG. 9E



Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device

☐ Symmetrix Device

cpq01

..... 000183500055

Hostname

cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Workload Specification

Workload Execution List

50-50

DSS1

DSS2

OLTP1

OLTP2

OLTP3

OLTP4

PROGRESS

random_0read

random_100read

random_read_100hit

RRH

RRM

sequential

sequential

SR

TERADAT.

Testoltp1

View

New

Edit

Copy

Delete

Start

<< Add

Remove >>

☒ ALL ☐ User ☐ Std

FIG. 9F



Workload Execution

Workloads: OLTP1

Iterations: 1

Dry Run

Configuration Rule: 1BA-1Port/Proc

OK Cancel

FIG. 9G



THROUGHPUT WORKLOAD

View Workload

Workload Description

random_100read

Delay

1.0

Cache Slots

0

Duration Time

30

Multiplier

4

SPIus Type

RT Multiplier

4

Unfric'd

LSeeks

0

RT Size

20000

I/O Loops

0

Random Range

0

Response Time

Throughput

Collect Response Times

Report Individual Response Times

OK

Cancel

Workload Transaction Definition

Size	% Workload	% Hits	% Random	% Read	Align	Align Back
0 MB 0KB 0B	100	0	100	100	0 MB 0KB 0B	0 MB 0KB

Request Size

0 MB 0KB 0B

Alignment

0 MB 0KB 0B

Back Alignment

0 MB 0KB 0B

% of Workload

100

% Cache Miss/Hit

100

% Sequential/Random

0

% Write/Read

0

Insert

Remove

FIG. 9I

Emc MarkNT Performance Characterization Workbench

File

Actions

View

Help

Symmetrix Configuration

Physical Device

cpq01

.....

000183500055

Add

Remove

Refresh

Hostname

cpq01

Add

Remove

Refresh

Definition

Environment

Workload

Configuration

Benchmark

Results

Other

Configuration Rule Definition

All Configuration Rules

Rule	P/E Expression	B/E Expr	
1/2Hyper		[01]	View
1DA_Port		M	New
1Hyper		0:M	Edit
10dd1Evert_BA	(01:a:0 01:b:0)	M	Copy
2Drives-3/4Hyper		[01]:[Delete
2Drives-3Hyper		[01]:[
2Drives-Not1Hyper		[02]:[
3/4Hyper		[012]	
3Drives		[012]	
3Drives-1/2Hyper		[012]	
3Drives-2Hyper		[012]	
3Drives-3/4Hyper		[012]	

ALL

User

Std

FIG. 9J



Configuration Definition

Rule Name:

OK Cancel

Rule Definition

F/E Expression: B/E Expression:

~Expression not yet Defined

F/E Expression:

B/E Expression:

Front-End

☒ FA-01:a:0 ☒ SA-16:a:0 None

☒ FA-05:a:0 ☒ SA-16:a:1

☒ FA-12:a:0 ☒ FA-01:a:0

Back-End

☒ DA-02:a:C ☒ DA-15:a:C None

☒ DA-03:a:C ☒ DA-02:a:C

☒ DA-14:a:C ☒ DA-03:a:C

Expressions

Build Update

Max I/O Second: Auto

Mirrors

☒ M1 ☐ M2 None

TIDs

☒ 0 ☐ 1 None

LUNs

☒ 0 ☒ 1 ☐ 2 ☐ 3 None

All

FIG. 9K



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Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

cpq01
+ 000183500055

Hostname
cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Benchmark Definition

Benchmark Execution List

All Benchmarks

Profiling Regression

View New Edit Copy Delete

Start

<< Add Remove >>

☒ ALL ☐ User ☐ Std

FIG. 9L



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A screenshot of a software dialog box titled "Benchmark Execution". The dialog has a standard Windows-style title bar with minimize, maximize, and close buttons. Inside, there is a checkbox labeled "Benchmark" which is currently checked. Below it is a text input field containing the word "Regression". To the right of the input field is a checkbox labeled "Dry Run" which is unchecked. Below the "Dry Run" checkbox is a label "Iterations:" followed by a numeric input field containing the number "3" and a dropdown arrow button. At the bottom right of the dialog are two buttons: "OK" and "Cancel".

FIG. 9M



View Benchmark

Benchmark Name

Regression

Cancel

OK

Benchmark Workload Definition

Workload	Configuration Rule	Delay Milliseconds	Cache Slots	Max IOPS
RRM	1Hyper	-1	-1	
RRM	Everything	-1	-1	
OLTP1	Everything	-1	-1	
OLTP2	3Hypers/4Drives	-1	-1	
OLTP3	1Hyper/2Drives	-1	-1	
DSS1	1Hyper	-1	-1	
DSS2	Everything	-1	-1	
TERADATA	2Drives/DA-3Hyper/4Drives	-1	-1	

Delay

0

Cache Slots

0

Max I/O Second

0

Bucket Size

0

Max Sequential Count

50

Min Test Period

0

Segment 1

0

Segment 2

0

Min Sequential Count

50

Multiplier

0

L Seeks

0

Start Byte

0

Disk Extent

0

Workload

RRM

Configuration Rule

1 Hyper

Insert

Remove



40/45

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

Physical Device

cpq01

..... 000183500055

Hostname

cpq01

Add

Remove

Refresh

Definition

Environment

Workload

Configuration

Benchmark

Results

Results Display

Reports

☒ Runtime

☐ Nohup

☐ Exceptions

☐ DB Summary

View

FIG. 90



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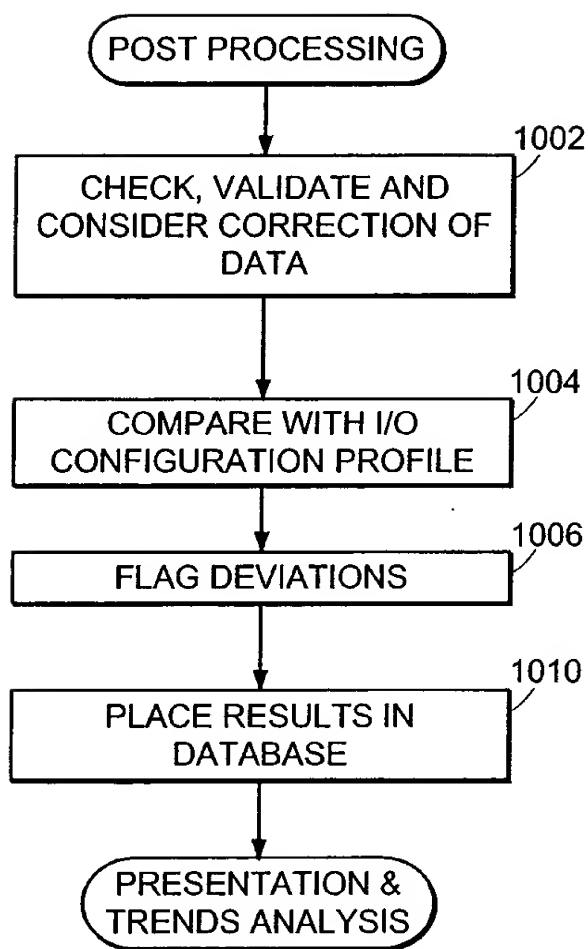


FIG. 10

FIG. 10A

Advanced Database Simulator Summary

Table Variables

Row: config

Column: req size

Configuration: test type

Test Description: none

Summary Functions

IO Function: max

MB Function: max

OK Cancel

FIG. 10B

Advanced Database Simulator Summary

Table Variables

Row: test type

Configuration: config

Column: interval

Summary Functions

IO Function: max

MB Function: min

OK Cancel

FIG. 11A

FIG. 11B

FIG. 11



FILE DESCRIPTIONS

FILE NAME	DESCRIPTION	HIGHLIGHTS
Char.Summary	SUMMARY FILE OF EACH CHARACTERIZATION TEST BROKEN DOWN BY ITERATION, TEST TYPE, AND CONFIGURATION	
Char.Splush	DATA FILE FEED TO Splush TO CREATE CHARACTERIZATION OBJECTS	
Char.Errors	CHARACTERIZATION ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES.	MESSAGE APPEARS IF ERROR FILE EXISTS
SX.Summary	SX SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
SX.Splush	DATA FILE FEED TO Splush: USED WITH Char.Summary FILE TO CREATE CHARACTERIZATION OBJECTS	
SX.Errors	SX ERRORS FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS

FIG. 11A



DB.Table	SUMMARY FILE OF EACH DB SIMULATOR TEST BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
DB.Splus	DATA FILE FEED TO Splus TO CREATE DBSimulator OBJECTS	
DB.Errors	DB SIMULATOR ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS
SX_DB.Summary	SX DB SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
SX_DB.Splus	DATA FILE FEED TO Splus. USED WITH DB.Splus FILE TO CREATE DBSimulator OBJECTS	
SX_DB.Errors	SX_DB ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS
Cache Ratio Report	REPORT TRACKING THE CACHE RATIO FROM THE SYM AND THE PROCESSED DATA	REPORT NAME: "CacheRatioReport.txt" LOCATED IN THE RAW DATA FOLDER MESSAGE APPEARS IF A REPORT

FIG. 11B



1208

Emc MarkNT
File Edit Project Log View Help

Project

Test Phase

Data Transfers

Process Raw Data

Post-Processing

Reporting

Database

Charts

Database
F:\TestArea\Regression.5266.Overnught\Database\symm48.5265

Test Type
Random Delayed Fast Write

Characterization

Req size: 512
Hypers: 1
BAs: 1
BA Procs: 1
BA Ports: 1

LUNs: 1
Drives: 2
DAs: 2
DA Procs: 2
DA Ports: 2

Type
☒ Online Chart
☐ By TestType
☐ View All

Scale
☐ Percent Scale
☒ Value Scale

Per Page
☐ 2
☐ 6
☒ 9
☐ 15
☐ 4
☐ 8
☐ 12
☐ 16

symm48.5265 fibre
☒ Freeze 5265.34.22 libre
☐ ucode 36 freeze/
☐ ucode 37 freeze

1202

Select DB

1200

Load DB Defaults

Chart

1204

1206

TestArea\symm48.5265.libre\ucode 38 freeze

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FIG. 12